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| EXAMINER |
|---|
| GEISEL, KARA E |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2877 | |

DATE MAILED: 07/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/022,239 | VO-DINH ET AL. | |
| | Examiner | Art Unit | |
| | Kara E Geisel | 2877 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *20 December 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,15-17,19-21,23,24,26-34 and 37-39* is/are rejected.

7)☒ Claim(s) *13,14,18,22,25,35 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Information Disclosure Statement*

The information disclosure statement filed on May 24th, 2002 has been fully considered by the examiner.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 23-24, 26-28, 30-31, 33-34, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Cullum et al. (High Temperature Fluorescence Measurements and Instrumentation for PAH), as cited by applicant.

In regards to claims 23 and 28, Cullum discloses two prior art vapor phase polycyclic aromatic hydrocarbon monitoring apparatus (page 42, lines 7-34) comprising means for generating electromagnetic radiation (page 42, lines 11 and 24-25), means for directing the radiation to a gaseous by-product produced by a material undergoing combustion (page 42, lines 9-10 and 25-27) and means for receiving emitted radiation from the material undergoing combustion having at least one wavelength characteristic of at least one polycyclic aromatic hydrocarbon and directing the emitted radiation to a detecting means (page 42, lines 13-15 and 27-29), wherein the means for directing the electromagnetic radiation is positionable to be co-located with the material undergoing combustion such that the electromagnetic radiation causes emitted radiation from the material undergoing combustion and the means for receiving the emitted radiation is positionable to be co-located with the material undergoing combustion such that the emitted radiation is collected (page 42, lines 7-34).

In regards to claim 24, the material undergoing combustion is a matter of choice of the user.

In regards to claim 26, the monitoring apparatus further comprises means for analyzing the emitted radiation from the material undergoing combustion (page 42, lines 14-17 and 29-34).

In regards to claim 27, the monitoring apparatus further comprises means for time resolving the monitoring apparatus (page 42, lines 22-34).

In regards to claim 30, the monitoring apparatus directs the emitted radiation to a wavelength separator using a second optical probe (page 42, lines 13-15 and 27-30).

In regards to claim 31, the electromagnetic radiation is produced from an excitation source (page 42, lines 10-11 and 24-25).

In regards to claim 33, at least a portion of the electromagnetic radiation has a wavelength of energy that excites an electron of a vapor phase polycyclic aromatic hydrocarbon to an excited state from which the electron returns to a lower energy state with a concomitant generation of a characteristic emitted wavelength (page 42, lines 7-34).

In regards to claim 34, the electromagnetic radiation is produced by a nitrogen laser, which is known to have an emitting wavelength of 337 nm.

In regards to claim 37, the system further comprises detecting a vapor phase polycyclic aromatic hydrocarbon by a characteristic wavelength contained in the emitted radiation (page 42, lines 17-21).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 7, 9, 10-12, 15-17, 19-21, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cullum et al. (High Temperature Fluorescence Measurements and Instrumentation for PAH), as cited by applicant and as applied to claims 23, 26-28, 30-31, 33, and 37 above, in view of Osada et al. (USPN 4,569,592).

In regards to claims 1, 7, and 32, Cullum discloses two prior art vapor phase polycyclic aromatic hydrocarbon monitoring apparatus (page 42, lines 7-34) comprising an excitation source producing electromagnetic radiation (page 42, lines 11 and 24-25), an optical path having at least a first optical probe, the optical path optically communicating the electromagnetic radiation received at a proximal end of the first optical probe to a distal end thereof such that the electromagnetic radiation interacts with at least one vapor phase polycyclic aromatic hydrocarbon produced by a material undergoing combustion (page 42, lines 9-10 and 25-27) and produces at least one wavelength characteristic of at least one polycyclic aromatic hydrocarbon (page 42, lines 13-15 and 27-29). Cullum does not disclose a positioner coupled to the first optical path, however it is well known in the art to use a positioner in order to move an optical fiber to a desired location in order to direct electromagnetic radiation to a sample.

For example, Osada et al. teaches the use of a positioner (fig. 1, 27) connected to the distal end of an optical probe (fig. 1, 28). The positioner is used in order to align the optical probe with a sample under investigation (columns 2-3, lines 56-68 and 1-7, respectively). Therefore, it would have been obvious to

one of ordinary skill in the art at the time the invention was made to couple a positioner to the distal end of the at least first optical probe to slidably move the probe to maintain the distal end position at a desired position with respect to an area of the material undergoing combustion, because it is well known in the art to do so. Furthermore, the positioning is carried out using mechanical energy to dynamically position the distal end of the first optical probe (column 3, lines 1-7).

In regards to claim 9, the combined system further comprises a second optical probe (Cullum page 42, lines 11-14 and 27-29), wherein the second optical probe optically receives the at least one emitted wavelength of radiation emitted from the vapor phase polycyclic aromatic hydrocarbon and directs the at least one emitted wavelength of radiation to a wavelength separator (Cullum page 42, lines 14-15 and 29-30).

In regards to claim 10, the first optical probe and the second optical probed can be arranged at an angle of 0 to 180-degrees (Cullum page 42, lines 27-29).

In regards to claim 11, Cullum does not disclose that the second optical probe is slidably movable such that a distal end of the second optical probe is maintained at a desired position with respect to an area of the material undergoing combustion, however it is well known in the art to use a positioner in order to move an optical fiber to a desired location in order to emitted radiation from a sample.

For example, Osada et al. teaches the use of a positioner (fig. 1, 37) connected to the distal end of a second optical probe (fig. 1, 38). The positioner is used in order to align the optical probe with a sample under investigation (column 3, lines 23-39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to couple a positioner to the distal end of the at least first optical probe to slidably move the probe to maintain the distal end position at a desired position with respect to an area of the material undergoing combustion, because it is well known in the art to do so.

In regards to claim 12, the combined system does disclose that the optical probe is made up of a fiber, but does not disclose a plurality of fibers. However it is well known in the art to use a plurality of

fibers in an optical probe in order to solve for various different problems. For example, a plurality of fibers may be used to combine wavelengths from a plurality of light sources to be directed to one part of a sample of interest, or a plurality of fibers may be used so that one probe may both emit the exciting radiation and receive the emitted radiation from a sample, with different fibers within the one probe dedicated to either emitting or receiving. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a plurality of optical fibers in the first optical probe, depending on the need.

In regards to claim 15, the excitation source comprises a laser (Cullum page 42, lines 11 and 25).

In regards to claim 16, an excitation source comprising a laser and a dye module are known in the art as useful sources for fluorescence excitation in the range of 360-990 nm. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an excitation source comprising a laser and a dye module in order to excite a hydrocarbon of interest in that wavelength range.

In regards to claim 17, an excitation source comprising a laser and an all solid-state tunable source would be useful in order to tune the laser to a certain wavelength (such as 337nm) in order to excite specific hydrocarbons of interest. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an excitation source comprising a laser and an all solid-state tunable source in order to excite a hydrocarbon of interest.

In regards to claim 19, the material undergoing combustion is a matter of choice of the user.

In regards to claim 20, the excitation source is a nitrogen laser (page 42, lines 11 and 24-25).

In regards to claim 21, the apparatus further comprises a photodiode in optical communication with the excitation source (page 42, lines 15 and 29-30), and a data-collecting device in operative communication with the detector (page 42, lines 16-21).

Claims 2, 4-6, 8, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cullum et al. (High Temperature Fluorescence Measurements and Instrumentation for PAH), as cited by applicant and as applied to claims 23, 26-28, 30-31, 33, and 37 above, in view of Osada et al. (USPN 4,569,592), as applied to claims 1, 7, 9, 10-11, 15-17, 20-21, and 32 above, and further in view of Hirschfeld (USPN 4,577,109).

In regards to claims 2 and 29, the combined monitoring apparatus is disclosed above. Cullum discloses a wavelength separator in optical communication with a second optical probe to receive the at least one emitted wavelength of radiation, and a detector operatively connected to the wavelength separator (page 42, lines 13-15 and 27-30). The combined system does not disclose a single probe to communicate the electromagnetic radiation and to receive the emitted wavelength radiation.

Hirschfeld discloses a monitoring apparatus for measuring fluorescence in a hostile environment such as high temperature. In one embodiment, the apparatus has two probes (fig. 1), one to communicate electromagnetic radiation to the sample (fig. 1, 20), and one to receive an emitted wavelength from the sample (fig. 1, 24). As an alternative embodiment, Hirschfeld uses a single optical probe (fig. 3, 31) to communicate the electromagnetic radiation to the sample, and receive the emitted radiation from the sample to communicate the emitted radiation to a wavelength separator and detector (fig. 3, 18). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the first optical probe be in communication with the wavelength separator and receive the at least one emitted wavelength of radiation at the distal end and optically communicate the at least one emitted wavelength of radiation from the distal end of the probe to the proximal end thereof such that the at least one emitted wavelength of radiation is received by the wavelength separator, in order to have an alternate embodiment of the two probe system.

In regards to claim 4, the wavelength separator of the combined system can be a spectrometer (Cullum page 42, lines 14-15).

In regards to claim 5, the wavelength separator of the combined system can be a monochromator (Cullum page 42, lines 29-30).

In regards to claim 6, the detector of the combined system can be a photodiode array (Cullum page 42, lines 15 and 30).

In regards to claim 8, the first optical probe is arranged in a 180-degree backscatter geometry (Hirschfeld fig. 3).

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cullum et al. (High Temperature Fluorescence Measurements and Instrumentation for PAH), as cited by applicant and as applied to claims 23, 26-28, 30-31, 33, and 37 above.

In regards to claim 38, Cullum does not disclose where the distal end of the first optical probe is. However, since the distal end allows the electromagnetic radiation interact with at least one vapor phase polycyclic aromatic hydrocarbon produced by a material undergoing combustion, the distal end of the optical probe would at least need to be substantially co-located outside an area of the material undergoing combustion or within a combustion zone of a material undergoing combustion.

Claims 3 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cullum et al. (High Temperature Fluorescence Measurements and Instrumentation for PAH), as cited by applicant and as applied to claims 23, 26-28, 30-31, 33, and 37-38 above, in view of Osada et al. (USPN 4,569,592), as applied to claims 1, 7, 9, 10-11, 15-17, 20-21, and 32 above, further in view of Hirschfeld (USPN 4,577,109), as applied to claims 2, 4-6, 8, and 29 above, and further in view of Berthold et al. (USPN 5,220,172).

In regards to claims 3 and 39, the combined system is disclosed above. The combined system does not disclose a trigger system operatively communicating with the excitation source and the detector, or gating a fluorescence signal in response to the electromagnetic radiation incident on a photodiode. However, it is well known in the art to use a trigger in communication with a pulsed light source and a

detector, in order to gate the fluorescence signal a detector receives with respect to the pulsing of the light source in order to time resolve the measurement.

For example, Berthold discloses a fluorescence analyzer. The analyzer comprises a trigger (fig. 5, 61) in operative communication with the excitation source (fig. 5, 63) and a detector (fig. 5, 73 and 73'). The fluorescence signal is gated by the trigger in response to the electromagnetic radiation incident on the detector to detect a fluorescence intensity as a function of time (column 8, lines 5-29). This is done in order provide time resolved comparisons between the excitation and fluorescence light of the sample. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add a trigger to the combined system in communication with the photodiode and the excitation source, and using this trigger to gate a fluorescence signal in response to the electromagnetic radiation incident on the detector to detect a fluorescence intensity as a function of time in order to time resolve the detection.

***Allowable Subject Matter***

Claims 13-14, 18, 22, 25, and 35-36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 13, the prior art of record, taken alone or in combination, fails to disclose or render obvious a monitoring apparatus for one or more vapor phase polycyclic aromatic hydrocarbons in a high-temperature environment comprising a first optical probe comprising a plurality of 600-μm $SiO_2/SiO_2$ fibers, at least one of the fibers being coated at the distal end thereof with a polymide, in combination with the rest of the limitations of claim 13.

As to claim 18, the prior art of record, taken alone or in combination, fails to disclose or render obvious a monitoring apparatus for one or more vapor phase polycyclic aromatic hydrocarbons in a high-

temperature environment wherein an all-solid state tunable source is equipped with an optical parametric oscillator, in combination with the rest of the limitations of claim 18.

As to claim 22, the prior art of record, taken alone or in combination, fails to disclose or render obvious a monitoring apparatus for one or more vapor phase polycyclic aromatic hydrocarbons in a high-temperature environment comprising a data-collecting device comprising an oscilloscope, in combination with the rest of the limitations of claim 22.

As to claim 25, the prior art of record, taken alone or in combination, fails to disclose or render obvious a monitoring apparatus for one or more vapor phase polycyclic aromatic hydrocarbons in a high-temperature environment wherein a means for directing the electromagnetic radiation comprises an optical probe positioned within a burning cigarette, in combination with the rest of the limitations of claim 25.

As to claim 35, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method for monitoring one or more vapor phase polycyclic aromatic hydrocarbons using electromagnetic radiation wherein a material undergoing combustion is a cigarette, a cigarette-like material, or a fuel, in combination with the rest of the limitations of claim 35.

As to claim 36, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method for monitoring one or more vapor phase polycyclic aromatic hydrocarbons using electromagnetic radiation wherein a material undergoing combustion is an aerosol sample of mainstream smoke or sidestream smoke from the combustion of a cigarette or a cigarette-like material, in combination with the rest of the limitations of claim 36.

***Additional Prior Art***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art made of record is Hayes et al. (USPN 4,432,225), Cooper et al. (USPN 5,684,580),

Schmucker et al. (USPN 6,008,894), Wahl et al. (USPN 6,008,895), and Potyrailo et al. (USPN 6,576,911).

Hayes discloses a method and apparatus for monitoring vapor phase PAH's by fluorescing the sample. The sample is cooled before the measurement occurs.

Cooper discloses a two probe device for monitoring aromatic hydrocarbons in a fluid using an excitation laser, a probe to excite the sample, a probe to receive excited radiation, a Raman spectroscopy device including a CCD for determining the concentration of the aromatic hydrocarbons.

Schmucker discloses an apparatus for use in hostile situations, for example high-temperature exhaust systems. The apparatus comprises an exciting laser, an optical probe for directing the light from the exciting laser to a sample of interest, and for receiving emitted light from the sample and directing the emitted light to a monochromator, and a detector, for detecting and monitoring substances in the sample of interest.

Wahl discloses a device for measuring stoichiometric ratios when burning hydrocarbons by collecting emitted fluorescence from the burning hydrocarbons via an optical probe and sending the emitted radiation to a detector.

Potyrailo discloses an optical probe for measuring fluorescence from a sample. The optical probe has a plurality of fibers arranged in a 6 around 1 configuration. Furthermore, Potyrailo discloses different type of light sources suitable for producing fluorescence in a sample of interest.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kara E Geisel whose telephone number is 703 305 7182. The examiner can normally be reached on Monday through Friday, 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 703 308 4881. The fax phone numbers for the organization where this application

or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications. For inquiries of a general nature, the Customer Service fax number is 703 872 9317.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 1782.

F.L. Evans
Primary Examiner
Art Unit 2877

K.G.

KEG
July 28, 2003